PRIORITY DOCUMENT

SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

Patent Office
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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2002951870 for a patent by NOTE PRINTING AUSTRALIA LIMITED as filed on 07 October 2002.

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PROVISIONAL SPECIFICATION

Invention Title: **Optically variable transitory embossed security document or device**

The invention is described in the following statement:

OPTICALLY VARIABLE TRANSITORY EMBOSSED SECURITY DOCUMENT OR DEVICE

This invention relates to security documents or tokens such as banknotes, cheques, travellers cheques, credit cards, identification cards, passports, stock and share certificates, tickets and the like, and is particularly concerned with providing a security device for security documents which is readily discernible only at certain viewing angles and which is difficult to copy or counterfeit.

The use of transitory embossed images as security devices in security documents has been previously proposed. For example, US 5,199,744 discloses a security device formed by embossing a substrate with a transitory image in association with an embossed non-transitory linear area which is visible from substantially all viewing angles. The transitory image may be a transient image which is one that can be seen when viewing the substrate normally but not when the substrate is viewed off normal, or a latent image which is one that cannot be seen when viewing the substrate normally but which can be seen when the substrate is viewed from certain off normal angles. In US 5,199,744, the surface to be embossed should be specularly reflecting, such as provided by a metallic ink. Also, the security device of US 5,199,744 requires the embossed non-transitory linear area to circumscribe or define an identifiable portion of the design element.

Although US 5,199,744 provides a transitory embossed security device which has some unusual visual effects, it has been discovered that more striking transitory coloured visual effects can be achieved by embossing an area of a substrate or security document which has been printed with an optically variable ink.

According to one aspect of the invention there is provided a security document or device comprising a substrate, a layer of optically variable pigment applied to an area of the substrate, and an embossed transitory image formed by embossing in the area of optically variable ink.

The term optically variable pigment as used herein refers to a coating composition, such as an ink, which provides a colour shift between two distinct colours with the colour shift being dependent upon the viewing angle. An example of such an optically variable ink (OVI) is described in EP 0,984,043 of SICPA Holding SA, and OVI is a Registered Trade Mark of SICPA Holding SA.

One example of an optically variable pigment is a green/blue OVI which appears green when viewed in reflection at viewing angles around the normal to the substrate, and which appears blue when viewed at acute angles to the plane of the substrate. Another example of an optically variable coating is one which changes colour from gold when viewed at normal incidence, to green when viewed obliquely.

While the optically variable pigment and the embossed transitory image may be provided on an opaque substrate, the optically variable pigment and the embossed transitory image are preferably applied at least partly in a transparent window of the substrate. The substrate may be formed from a transparent plastics material to which at least one opacifying coating has been applied, except in the region of the transparent window. Alternatively, a transparent plastics substrate could be inserted as a window in a security document formed from paper or other material.

According to another aspect of the invention there is provided a method of forming an optically variable transitory embossed image for a security document or device comprising the steps of applying an optically variable pigment over an area of a substrate, and embossing said area of the substrate to form an embossed transitory image.

In a particularly preferred embodiment, the optically variable pigment and the embossed transitory image are applied over at least part of a transparent window and over part of an opaque region surrounding the transparent window.

In another preferred embodiment, the optically variable pigment is applied to one side of the substrate and the embossing step is performed by embossing

the opposite side of the substrate.

The transitory embossed image is preferably formed by embossing at least one set of lines or dots in the area of the optically variable pigment. Surprisingly, it has been found that for a transitory image formed from a set of embossed lines or dots on an area of optically variable pigment, the part of the image formed by the embossed lines appears substantially the same colour as the optically variable pigment when viewed in reflection at normal viewing angles to form a latent image but as the viewing angle changes to more oblique moving angles, although the colour of the optically variable pigment changes (eg from green to blue), the part of the transitory image formed by embossed lines extending perpendicularly to the viewing direction does not change colour (eg stays green) and so differs from the changed colour of optically variable pigment at oblique viewing angles to reveal the latent image at that angle. The transitory embossed image is preferably substantially hidden when viewed in transmitted light.

It has also been discovered that unusual visual effects can be obtained when the transitory embossed image includes a first set of embossed lines or dots extending in one direction, and a second set of embossed lines or dots extending in a different direction. The first set of embossed lines or dots may form a first part or a background of the transitory embossed image and the second set of embossed lines or dots may form a second part of the transitory embossed image, eg indicia, such as numbers and/or lettering, or a picture. In one preferred embodiment, the second set of embossed lines or dots extends substantially perpendicularly to the first set of embossed lines or dots.

Further, different unusual colour effects provided by the transitory embossed image can be observed when the image is viewed in reflection through rotations in different planes perpendicular to the substrate and also through a rotation in a plane substantially parallel to the substrate, with different parts of the image appearing either the same colour or a different colour as the optically variable pigment at different viewing angles, so that different parts of the transitory embossed image appear to switch on and off in different colours at different viewing angles.

The present invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a schematic plan view of a security document incorporating an optically variable transitory embossed image;

Figure 2 is an enlarged view of the optically variable transitory embossed image of Figure 1;

Figure 3 is a schematic view of the security document of Figure 1 being viewed in reflection from a first viewing angle;

Figure 4 is a schematic view of the security document being viewed in reflection from a more oblique viewing angle;

Figure 5 is a schematic view of the security document being viewed in reflection from another oblique viewing angle;

Figure 6 is a schematic section through the security document on the line X-X of Figure 1; and

Figure 7 is a schematic section through a security document incorporating a modified security device in accordance with the invention.

Figures 1 to 5 show a rectangular security document 1, such as banknote, which is provided with a transparent window 2 and a security device 3 in the form of an optically variable transitory embossed image. The remaining region 4 of the document 1 outside the transparent window 3 is substantially opaque. The opaque region 4 is printed with indicia. The optically variable transitory embossed image forming the security device 3 preferably overlaps part of the transparent window 2 and part of the surrounding opaque region 4.

As shown in Figure 6, the security document 1 of Figure 1 is preferably formed from a substrate 10 of transparent plastics material with an opacifying layer 14 on both sides of the substrate 10 except in a region 12 which forms the

transparent window 2 in the security document. Preferably, the transparent plastics material forming the substrate 10 is a laminated film of biaxially oriented polymeric material, such as disclosed in Australian patent no. 558476 (AU-87665/82). It will, however, be appreciated that the security document 1 may be formed from other materials, eg a substantially opaque paper or plastics substrate with a piece of transparent plastics material inserted into the substrate to form the transparent window 2.

The opacifying layer 14 preferably comprises a coating of a substantially opaque ink applied to opposite surfaces of the substrate 10, although it will be appreciated that other opacifying layers may be used. For example, a transparent plastics substrate may be sandwiched between layers of substantially opaque paper or plastics material.

Referring more particularly to Figures 2 and 6, the security device 3 comprises a layer of optically variable pigment 11 applied to an area 13 of the substrate 10 which is embossed with sets of embossed lines 15, 16 extending in different directions to form an optically variable transitory embossed image. As shown in Figure 2, the area 13 of optically variable pigment is elliptical in shape, the first set of embossed lines 15 extend transversely across the longitudinal axis of the elliptical area 13, and the second set of embossed lines 16 extend parallel to the longitudinal axis of the elliptical area 13. The first set of embossed lines 15 form a first part, the background, and the second set of embossed lines 16 form a second part, the letter OVI, of the optically variable embossed image.

The optically variable pigment used in the present invention is a coating composition in the form of an optically variable ink, which provides a colour shift between two distinct colours with the colour shift being dependent upon viewing angle. Such optically variable inks may be made by producing an optically variable thin film structure using layers of metallic or high refractive materials (eg certain metal oxides or metal sulphides) and dielectric materials, grinding the film into microflakes and adding the flakes to an appropriate ink medium. Another method for the production of an optically variable pigment which incorporates a totally reflecting layer made by physical vapour deposition from aluminium alloy is

disclosed in EP0984043 of SICPA Holding SA. These type of optically variable pigments and inks are distinguished from metallic inks and coatings which have a reflecting metallic appearance and from optically variable inks of the pearl lustre type which present a conspicuous pearl lustre effect in reflection, while in transmission the substrate takes an unmistakable complementary hue. In such optically variable inks of the pearl lustre type, the colour shift with the angle of observation is small.

The unusual colour effects exhibited by the embossed transitory image forming the security device 3 of Figures 1 and 2 will now be described with reference to Figures 3 to 5 in which λ_1, denotes the wavelength of a first colour of the optically variable ink (eg green) and λ_2 denotes the wavelength of a second colour of the optically variable ink (eg blue).

Figures 3 and 4 show the security device 3 being viewed in reflection at different angles through a rotation in a plane substantially perpendicular to the substrate and to the direction of the longitudinal lines of the second set of embossed lines 16. When the security device is viewed at angles around the perpendicular to the plane of the substrate as shown in Figure 3, the light is diffuse and both parts of the image formed by the first and second sets of embossed lines 15 and 16 appear the same colour λ_1 (eg green). Thus, the image is substantially hidden at those viewing angles. As the viewing angle decreases from the perpendicular to an oblique viewing angle as shown in Figure 4, the part of the image formed by the first set of embossed of lines 15 extending parallel to the direction of rotation changes colour λ_2 with the optically variable ink (eg from green to blue), while the part of the image formed by the second set of embossed lines 16 extending perpendicularly to the viewing direction remains the same original colour λ_1 (eg green). Thus, the transitory image (the letters OVI) formed by the second set of embossed lines 16 becomes highly visible at this oblique viewing angle owing to the contrast between the first colour λ_1 (eg green) of the letters OVI formed by the second set of lines 16 and the second colour λ_2 (eg blue) of the background formed by the first set of embossed lines 15.

Figure 5 shows the security device being viewed in reflected light at an

oblique viewing angle in a direction substantially parallel to the second set of lines 16 and perpendicular to the first set of lines. From this viewing angle, the part of the image formed by the first set of embossed lines 15, which are now perpendicular to the viewing direction, have changed colour to λ_1 (eg green) whereas the part of the image formed by the second set of embossed lines 16, which are now parallel to the viewing direction have changed colour to λ_2 (eg blue). Once again, the transitory image (the letters OVI) formed by the second set of embossed lines 16 is highly visible at this viewing angle owing to the contrast between the observed colours λ_1 and λ_2 (eg green and blue) of the different sets of embossed lines 15 and 16.

When the oblique viewing angle changes from the oblique angle of Figure 4 to the oblique angle of Figure 5, ie in a horizontal plane substantially parallel to the plane of the substrate, the transitory image disappears because at intermediate viewing angles both parts of the image formed by the first and second sets of embossed lines appear the same colour λ_2 (eg blue) as the optically variable ink at that angle.

Also, as the viewing angle increases towards the perpendicular through a rotation in a plane substantially perpendicular to the substrate and to the direction of the transverse lines of the first set of embossed lines 15, the latent image becomes substantially hidden again because the parts of the image formed by the first and second sets of embossed lines 15 and 16 appear the same colour λ_1.

As shown in Figures 1 to 6, the optically variable transitory embossed image 13 forming the security device 3 overlaps the transparent window 2 and the opaque region 4 of the security document 1. This also creates an unusual optical effect in that the colour changing effects of the portion of the transitory embossed image provided in the area of the transparent window 2 are visible in reflected light from both sides of the security document, whereas the colour changing effects of the portion of the transitory embossed image provided on the opaque region 4 are only visible in reflected light from one side of the security document 1, that is the side on which the layer of optically variable pigment 11 has been applied.

A further unusual visual effect is observed when the portion of the transitory embossed image 13 in the area of the transparent window 2 is observed in transmitted light. When an optically variable ink (OVI) of the kind produced by SICPA Holding SA is applied to a transparent substrate, the striking colour changing effects seen in reflected light are not observable in transmitted light. Instead the OVI can appear as a dull grey colour in transmitted light irrespective of the viewing angle, and the portion of the transitory embossed image provided on the OVI in the area of the transparent window is substantially invisible when observed in transmitted light, once again forming a latent image which is only observable at certain angles in reflected light.

While Figures 1 to 6 show the transitory embossed image 3 overlapping the transparent window 2 and the opaque region 4, it will, however, be appreciated that the transitory embossed image in accordance with the invention could be provided solely within a transparent window 2 of the security document 1, solely on the opaque region 4, or even on a completely opaque substrate or security document.

Figure 7 shows a modified embodiment in which a security device 3 in the form of an optically variable transitory embossed image 13 is provided completely within the transparent window 2 of a security document 1.

The security device 3 of Figure 7 is formed in the same manner as described with reference to Figure 6, except that the layer of optically variable pigment 11 is applied to an area of the substrate 10 totally within the transparent window 2, and only that area of the substrate 10 is embossed with sets of lines 15, 16 so that the optically variable transitory embossed image 13 does not extend to or overlap the opacifying layer 14 forming the opaque region 4 of the security document. As described above, the transitory image 13 formed by the sets of embossed lines is a latent image which is substantially invisible in transmission, and which is only clearly visible in reflected light at certain oblique viewing angles.

In a preferred method of manufacturing a security document or a security device such as described with reference to Figures 1 to 7, the opacifying layers 14

are applied to opposite surfaces of the transparent substrate 10, eg by printing, over region 4 of the substrate 10 to form the transparent window 2, the layer of optically variable pigment 11 is then applied to one side of the substrate 10 in the area where the security device 3 is to be located in a printing operation eg by silk screen printing, offset or gravure printing, and finally the area of the substrate 10 containing the layer of optically variable pigment 11 is embossed, engraved or otherwise deformed to form the sets of embossed lines 15 and 16 to form the optically variable transitory embossed image. The embossing step may be performed by applying pressure to at least one side of the substrate in a stamping operation or in an intaglio printing operation in which raised printed lines are applied to at least one side of the substrate 10 in the opaque region 4. Preferably, the embossing step is performed on the opposite side of the substrate 10 to the side on which the layer of optically variable ink 11 is applied to reduce the likelihood of the ink layer 11 cracking.

In a simple embodiment the transitory image may comprise of embossed lines formed in the substrate, the lines having a predetermined height H and a predetermined spacing S. The H may vary from a minimum of about 5 microns to a maximum corresponding to the maximum embossable height of the substrate. The spacing S depends on the height and the ratio S:H is typically from about 6:1 to 2:1.

It will be apparent from the description above that the present invention provides a security device which has some unusual visual effects. A security document incorporating such a security device is also difficult for counterfeiters to reproduce. It would not be possible to produce the effects of the optically variable transitory embossed image by colour photocopying, and a counterfeiter would require access not only to an appropriate transparent polymeric substrate, but also the specific optically variable ink used by the document printing authority and appropriate embossing apparatus in order to produce a counterfeit document.

It will also be appreciated that various modifications and alterations may be made to the embodiments described above without departing from the scope and spirit of the present invention. For example, the transitory embossed image may

be formed by at least one set of embossed dots, which extend in lines substantially parallel to other lines of dots in the set. Also, the area of optically variable pigment may extend outside the area which is embossed with the lines or dots. In this case, a single set of embossed lines or dots may be provided, with the image formed by the set of embossed lines or dots appearing a different colour to the surrounding area of optically variable ink when viewed in reflection at an oblique angle in a plane perpendicular to the direction of the embossed lines or dots; the image appearing the same colour as the background of optically variable ink when viewed in reflection at an oblique angle in a plane parallel to the direction of the embossed lines or dots. Preferably, however, the embossed image is formed by at least two sets of embossed lines or dots extending at different angles to one another. It will also be appreciated that more than two sets of embossed lines or dots may be provided to form a more complex transitory embossed image with different parts of the image appearing at different oblique angles. It is also envisaged that the usual visual effects of the present invention could be obtained by directly printing a transitory embossed image using OVI during the intaglio process.

Note Printing Australia Ltd

By their Registered Patent Attorneys
Freehills Carter Smith Beadle

7 October 2002

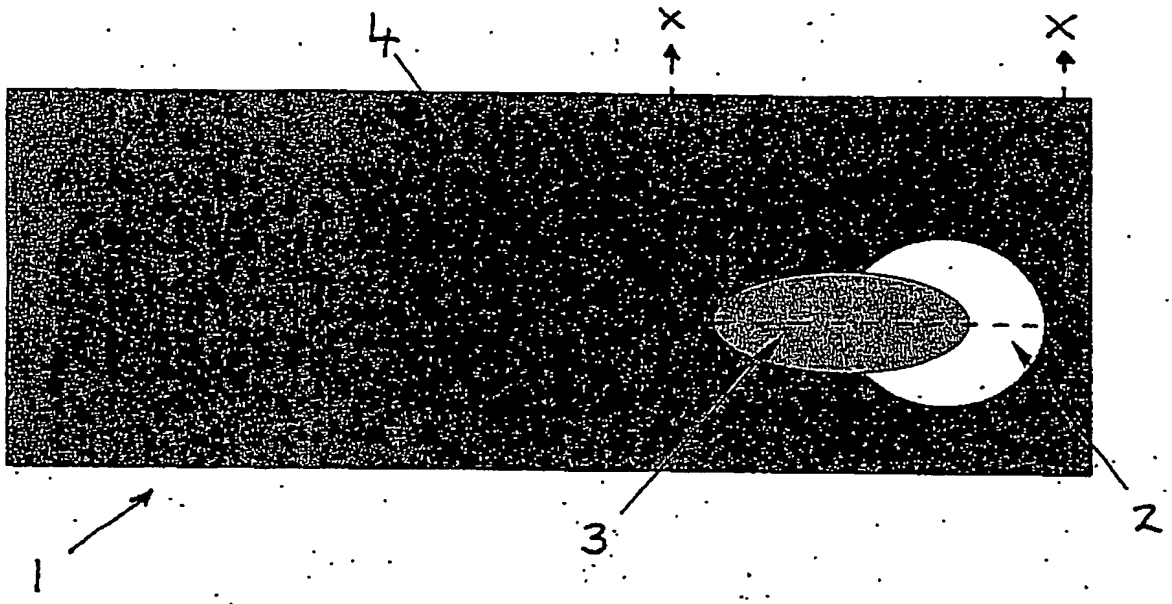

Figure 1

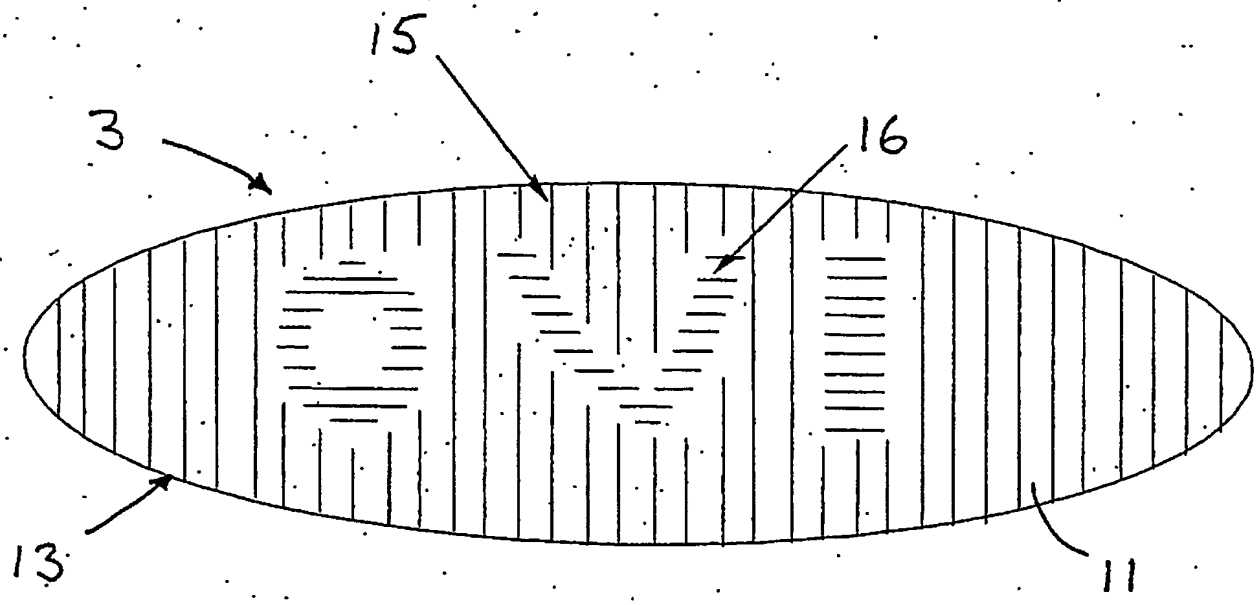

Figure 2

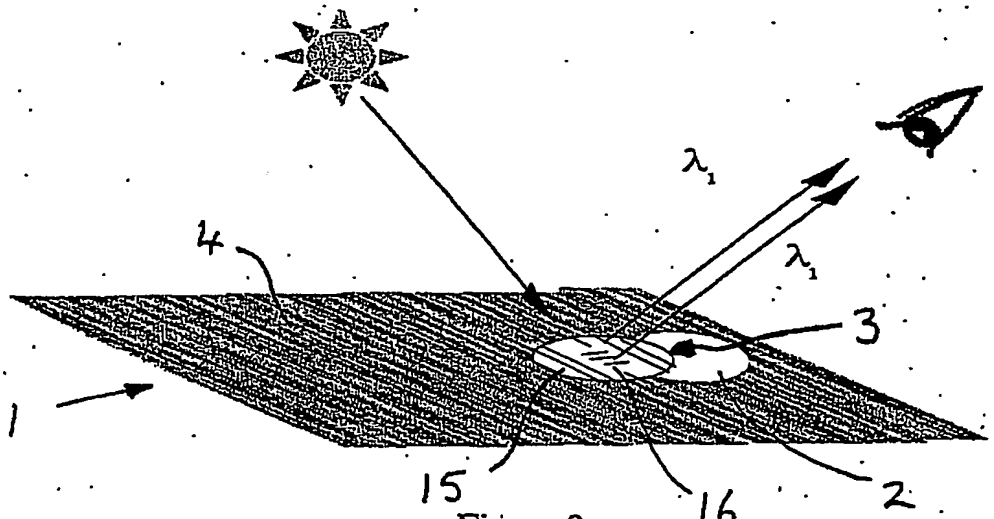

Figure 3

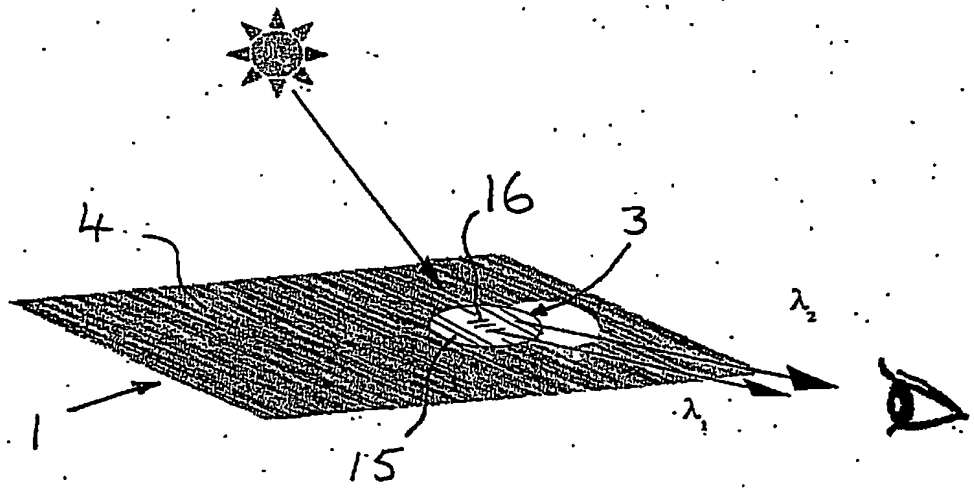

Figure 4

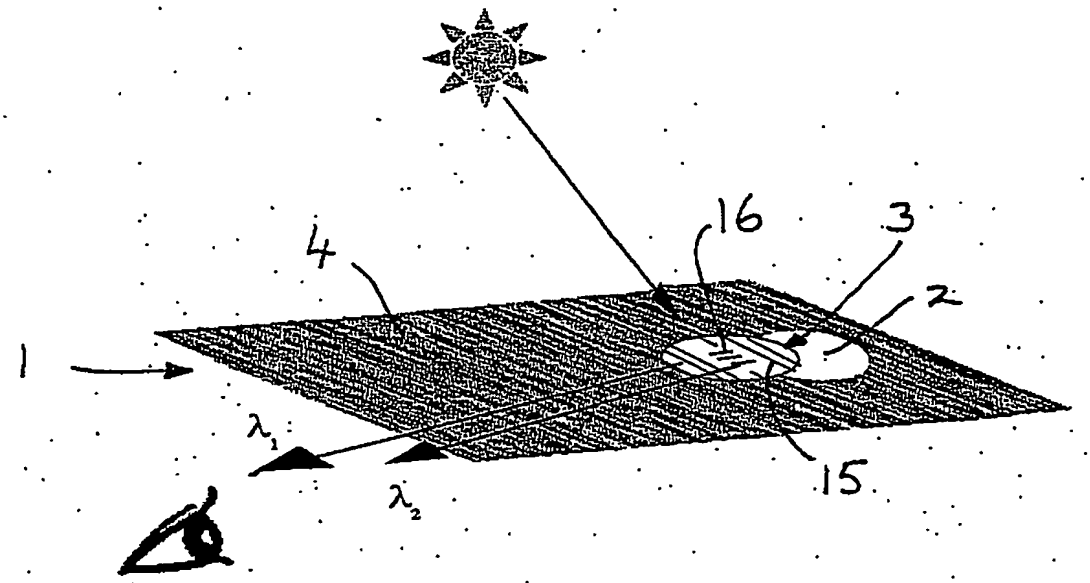

Figure 5

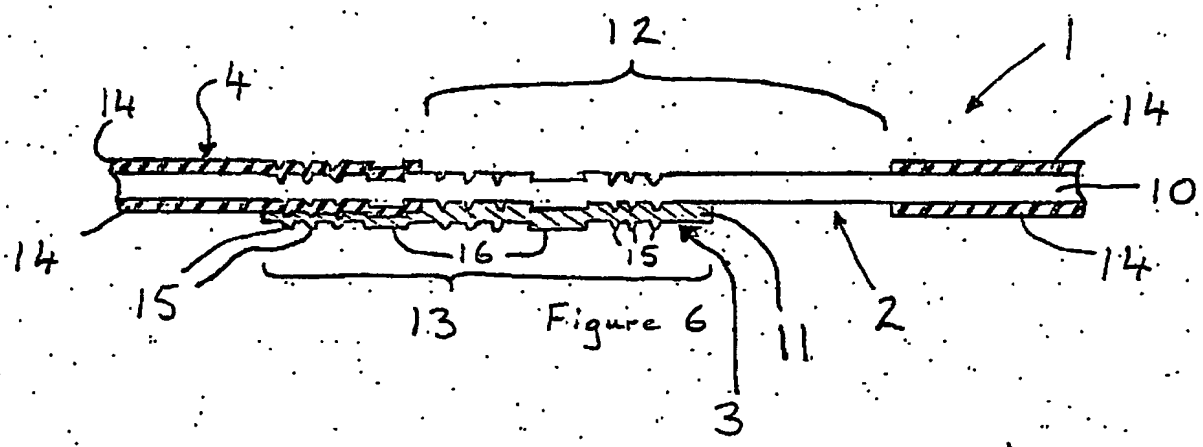

Figure 6

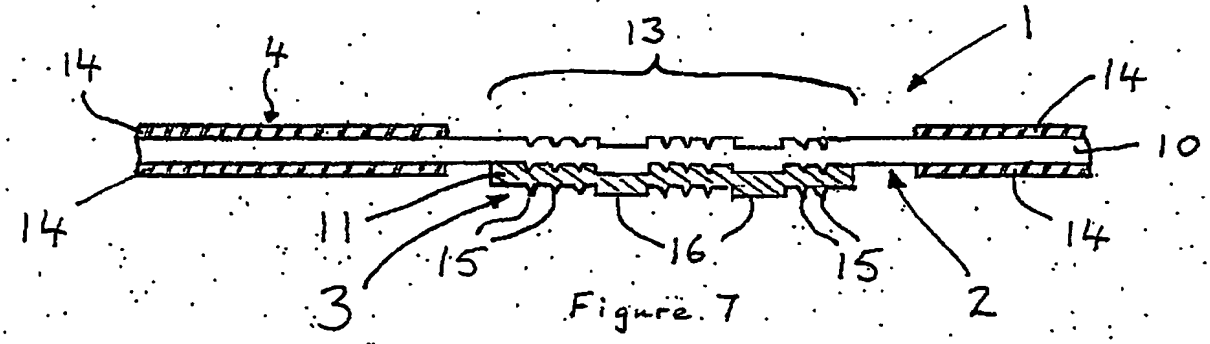

Figure 7